

Electrical code issues and answers.

● Inspectors Using Hand-held Computers

It's finally a reality. The much-anticipated implementation of the Fujitsu Stylistic 2300 hand-held computer has begun. Training for the electrical inspectors who will be using the new technology started on April 10th and will be completed May 24th.

This new technology was necessary to replace an obsolete system of "bubble sheets" that have fields that require blackening in and then are put through a scanning machine for input into the permits system. Over the past few years hardware for the scanning machines has become increasingly harder to find, and some parts are unavailable.

The new system will allow inspectors to connect the hand-held unit to the computer network in the morning and download the day's inspections into the unit, take the unit to the field, and enter inspection data into the hand-held computer. The following morning the unit is reconnected to the computer network and the previous day's inspections are up loaded into the permit system and new inspections requests are downloaded.

Some of the advantages of the new system are more accurate data input, the complete inspection history is at the inspectors finger tips, comments and notes can be entered into the computer in the field, and the units have the capability for future expansion.

● Protection of Grounding Electrode Conductor.

Article 250-64 (b) allows a grounding electrode conductor sized #4 AWG and larger to be run without physical protection where the conductor is judged to be free from exposure to severe physical damage.

A # 6 AWG grounding electrode conductor may also be run without physical protection where the conductor is judged to be free from physical damage AND where run along the surface of the building construction where it is securely fastened to the construction.

Grounding electrode conductors smaller than #6 AWG and #6 AWG conductors that are subject to physical damage must be in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing or cable armor. When the grounding electrode conductor is run in metallic raceways the ends of the raceways must bond to the grounding electrode conductor at both ends to comply with the requirements of NEC 250-64 (e).

The grounding electrode conductor that runs between ground rods that are remote from a building will be considered to be free from physical damage where buried in the earth a minimum of 12 inches below grade level.

● Access and Working Space.

As real estate and building costs escalate, owners and designers look for ways to maximize building space. One way is to reduce the size of the dedicated space required for electrical equipment. It is important that the minimum requirements of NEC 110-26 be consulted so that adequate space will be provided at electrical equipment requiring examination, adjusting, or servicing. This working space is required to be equal to the width of the equipment or 30 inches, whichever is greatest. The depth of the working space varies from 3 to 4 feet depending on the voltage, and whether there are grounded, ungrounded or live parts on the opposite wall.

An important and often overlooked requirement is contained in part C. This deals with the access and entrance requirements to the working space. The general rule allows a single entrance, but if the equipment is over 6 feet wide and rated 1200 amps or more the single entrance rule is modified.

"For equipment rated 1200 amps or more and over 6 feet wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance not less than 24 inches wide and 6 1/2 feet high at each end of the working space."

There are two exceptions that allow a single means of access

"Exception No. 1: Where the location permits a continuous and unobstructed way of exit travel, one means of access shall be permitted."

"Exception No. 2: Where the workspace required by Section 110-26(a) is doubled, only one entrance to the working space is required."

Failing to address these requirements during the design stage can result in costly problems and delays later on, such as adding entrances, relocating equipment and even relocating walls.

● When is a Light Required in an Attic, Under Floor Space, Etc?

NEC 210-70(3) states: *"For attics, under-floor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing."* Examples of "equipment requiring servicing" that may be installed in these locations include but is not limited to electronic air filters, equipment requiring air filter replacement, water pumps, sump pumps, heating and cooling units, and air handlers. A light is not required for equipment that is designed to be essentially maintenance free such as an attic fan. If the manufacturer's installation instructions state that the product requires no maintenance to deliver the intended service life of the product, a light will not be required. A light will be required when the space is used for storage of any kind.

● Identification of Disconnecting Means.

NEC 110-22 states: *"Each disconnecting means required by this Code for motors and appliances, and each service, feeder, or branch circuit at the point where it originates, shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved."*

It is important that electricians comply with the requirements of this code section. Proper labeling of disconnecting means helps assure a safe electrical environment be it in an industrial, commercial or residential application. In a situation where power must be disconnected quickly, it is essential that any disconnect, whether it is for large industrial machinery or something as simple as a residential branch circuit, be easily identifiable by the person who will disconnect the circuit.

All too often, branch circuits are identified in electrical panelboards by simply labeling the circuit "lights", "plugs", "kitchen" etc. In the interest of safety, circuit directories should more narrowly define the function of the circuit. Examples are "Kitchen and Dining room lights", "Master Bedroom lights and plugs", "Kitchen Counter Outlets" etc.

Equipment disconnecting means must also be labeled and a description of the specific equipment to be disconnected should be included on the disconnect. An example would be where multiple disconnecting means are installed within sight of three separate air conditioning units. The disconnects should be marked "left AC Unit", "Center AC Unit", "Right AC Unit", or with other descriptions that identify each specific unit rather than marking all three units "Air Conditioner". In cases where the purpose of the disconnect is clear, marking of the disconnect is not required. An example of this is when the disconnect is part of or is mounted on the equipment that it disconnects. Installers should be mindful that what is obvious to them may not be for individuals that may be required to disconnect the equipment.

Marking of disconnecting means must be done in a manner that will not be adversely affected by the environment in which it is installed.

● Made and Other Electrodes.

One of the ten most often referenced code articles inspectors cite while performing electrical inspections is Article 250-52 of the National Electrical Code which states in part: *"Where none of the electrodes specified in Section 250-50 is available, one or more of the electrodes specified in (b) through (d) shall be used. Where practicable, made electrodes shall be embedded below permanent moisture level. Made electrodes shall be free from nonconductive coatings such as paint or enamel. Where more than one electrode is used, each electrode of one grounding system (including that used for air terminals) shall not be less than 6 ft (1.83 m) from any other electrode of another grounding system. Two or more grounding electrodes that are effectively bonded together shall be considered a single grounding electrode system."* The following is a brief summary of NEC 250-52. **This newsletter article does not replace study of NEC 250-52 to grasp a complete understanding of this code.**

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| Underground gas piping cannot be used | Aluminum electrodes cannot be used |
| Rod and pipe electrodes must be at least 8 feet in length | Pipe electrodes must be ¾ inch minimum diameter |
| Rods of iron and steel must have corrosion protection Rods of iron and steel must be 5/8 in. diameter minimum | Plate electrodes must be buried 2 ½ feet below grade Plate electrodes must have 2 square ft. of surface area |
| Stainless rods smaller than 5/8 in. diameter and non-ferrous rods not smaller than ½ in. must be listed | Metal underground systems such as piping systems and underground tanks may be used as a grounding electrode |
| Drive ground rods a minimum of 8 feet. If rods cannot be driven straight 45 degree angle is OK or bury rod a minimum of 2 ½ feet below grade level | |

